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ABSTRACT

Developed through a modified DACUM (Developing a Curriculum) process involving business, industry, labor, and community agency representatives in Ohio, this document is a comprehensive and verified employer competency profile for heating, ventilation, air conditioning, and refrigeration occupations. The list contains units (with and without subunits), competencies, and competency builders that identify the skills needed to enter these occupations. The occupational, academic, and employability skills for this occupation or occupational area are included. Within the outline are three levels of items: core, advancing, and futuring. Core items identify the knowledge, skills, and attitudes essential for entry-level employment. These items are required to be taught and will be the basis for questions on the state vocational competency tests. Advancing items identify the knowledge, skills, and attitudes needed to advance in the occupation; futuring items identify the knowledge, skills, and attitudes needed to enter and remain in a given occupation 3 to 4 years from now. Titles of the 14 units are as follows: basic procedures; fundamental concepts of electricity; single-phase and three-phase circuits and devices; fundamental concepts of refrigeration; basic shop practices; shop practice and tools; installing refrigeration and air conditioning equipment; preventive maintenance; troubleshooting refrigeration and air conditioning equipment; servicing and repairing refrigeration and air conditioning equipment; installing heating systems; troubleshooting heating systems; servicing and repairing heating systems; and employability skills. (YLB)

ED345074

OCAP

OHIO'S COMPETENCY ANALYSIS PROFILE

HEATING, VENTILATION, AIR-CONDITIONING, AND REFRIGERATION

U.S. DEPARTMENT OF EDUCATION
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Ohio's Future at Work

Division of Vocational and Career Education
Ohio Department of Education

Vocational Instructional Materials Laboratory
Center on Education and Training for Employment

THE OHIO STATE UNIVERSITY

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What is OCAP?

"A comprehensive and verified employer competency list will be developed and kept current for each program." This is the second objective of Imperative 3 of the *Action Plan for Accelerating the Modernization of Vocational Education: Ohio's Future at Work*. Ohio's Competency Analysis Profile (OCAP) lists are the Division of Vocational and Career Education's response to that objective. OCAP lists evolve from a modified DACUM process involving business, industry, labor, and community agency representatives from throughout Ohio. The OCAP process is directed by the Vocational Instructional Materials Laboratory at The Ohio State University's Center on Education and Training for Employment.

How is OCAP used?

Each OCAP contains units (with and without subunits), competencies, and competency builders that identify the occupational, academic,* and employability skills needed to enter a given occupation or occupational area. Within that outline there are three levels of items: core, advancing, and futuring. Core items identify the knowledge, skills, and attitudes essential for entry-level employment. These items will be the basis for questions on the state vocational competency tests (scheduled to begin in school year 1993-94). Advancing items (marked with one asterisk) identify the knowledge, skills, and attitudes needed to advance in a given occupation. Futuring items (marked with two asterisks) identify the knowledge, skills, and attitudes needed to enter and remain in a given occupation three to four years from now.

School districts may add as many units, subunits, competencies, and/or competency builders as desired to reflect local employment needs, trends, and specialties. Local advisory committees should be actively involved in the identification and verification of additional items. Using OCAP lists, instructors will be able to formulate their vocational courses of study and monitor competency gains via the new criterion-referenced competency testing program that will be directly tied to the competencies identified on the OCAP lists.

***Academic competencies have not been identified for all OCAPs. At a later date math, communication, and science competencies will be released.**

The **Employability Skills** portion of this list was verified by the following employer panel:

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Ohio Competency Analysis Profile
Heating, Ventilation, Air-Conditioning, and Refrigeration

Unit 1: Basic Procedures

Competency 1.0.1: Use personal safety equipment according to Occupational Safety and Health Administration (OSHA) standards

Competency Builders:

1.0.1.1 View graphic audiovisual materials regarding safety
1.0.1.2 Wear side-shield safety glasses or goggles
1.0.1.3 Wear ear protection
1.0.1.4 Wear hard-toed shoes
1.0.1.5 Wear hard hat
1.0.1.6 Wear appropriate dust mask
1.0.1.7 Wear gloves
1.0.1.8 Wear appropriate clothing
1.0.1.9 Secure long hair

Competency 1.0.2: Use safety and fire equipment according to OSHA standards

Competency Builders:

1.0.2.1 Check power sources for potential hazards
1.0.2.2 Check for proper grounding
1.0.2.3 Use appropriate fire extinguishers
1.0.2.4 Demonstrate basic first-aid techniques
1.0.2.5 Use power disconnect switches and lockout/tag out procedures
1.0.2.6 Check all safety apparatus and equipment
1.0.2.7 Use safety apparatus and equipment
1.0.2.8 Conduct routine safety inspections
1.0.2.9 Use proper ladder and scaffolding procedures

Competency 1.0.3: Identify, handle, use, and dispose of hazardous materials

Competency Builders:

1.0.3.1 Read and follow container label precautions
1.0.3.2 Read material safety data sheet (MSDS) for each hazardous material
1.0.3.3 Follow procedures specified on MSDS
1.0.3.4 Store and dispose of hazardous materials according to Environmental Protection Agency (EPA) specifications

Competency 1.0.4: Use, handle, and store tools, materials, and equipment according to manufacturers' guidelines

Competency Builders:

1.0.4.1 Identify potential hazards of hand tools
1.0.4.2 Demonstrate safe use of all hand tools
1.0.4.3 Demonstrate safe handling and lifting methods
1.0.4.4 Operate power tools
1.0.4.5 Operate power equipment
1.0.4.6 Maintain and check all hand tools
1.0.4.7 Maintain and check all power equipment
1.0.4.8 Demonstrate pride in use and care of equipment and supplies

Unit 2: Fundamental Concepts of Electricity

Competency 2.0.1: Analyze and measure values in direct current (DC)

Competency Builders:

2.0.1.1 Analyze applications of magnetism in electricity
2.0.1.2 Apply magnetic principles to electrical theory
2.0.1.3 Compare conducting and insulating materials
2.0.1.4 Determine resistor values
2.0.1.5 Apply Ohm's law
2.0.1.6 Apply Kirchhoff's law
2.0.1.7 Construct and analyze simple DC circuits
2.0.1.8 Construct and analyze series DC circuits
2.0.1.9 Construct and analyze parallel DC circuits
2.0.1.10 Construct and analyze series-parallel DC circuits
2.0.1.11 Measure current, voltage, and resistance in DC circuits
2.0.1.12 Identify simple DC generator action
2.0.1.13 Identify simple DC motor action
2.0.1.14 Identify principals of solid-state switching devices*

Competency 2.0.2: Analyze and measure values in alternating current (AC)

Competency Builders:

2.0.2.1 Construct and analyze simple AC circuits
2.0.2.2 Construct and analyze series AC circuits
2.0.2.3 Construct and analyze parallel AC circuits
2.0.2.4 Construct and analyze series-parallel AC circuits
2.0.2.5 Compare peak (PK), root mean square (RMS), and average values
2.0.2.6 Evaluate AC power
2.0.2.7 Evaluate transformers
2.0.2.8 Measure current, voltage, and resistance in AC circuits
2.0.2.9 Identify simple AC generator action*
2.0.2.10 Identify simple AC motor action*

Competency 2.0.3: Use test equipment

Competency Builders:

2.0.3.1 Make appropriate measurements using clamp-on ammeter
2.0.3.2 Make appropriate measurements using multimeter
2.0.3.3 Make appropriate measurements using digital multimeter
2.0.3.4 Make appropriate measurements using megger*

Unit 3: Single-Phase and Three-Phase Circuits and Devices*

Competency 3.0.1: Demonstrate knowledge of single-phase motors*

Competency Builders:

3.0.1.1 Analyze single-phase motors*
3.0.1.2 Analyze single-phase motor starting systems*

Competency 3.0.2: Demonstrate knowledge of three-phase motors*

Competency Builders:

3.0.2.1 Identify ways to connect three-phase motors*
3.0.2.2 Troubleshoot three-phase motors*

Unit 4: Fundamental Concepts of Refrigeration

Competency 4.0.1: Analyze physical laws as applied to refrigeration

Competency Builders:

4.0.1.1 Measure, record, and compare temperature
4.0.1.2 Measure, record, and compare pressure
4.0.1.3 Measure, record, and calculate volume
4.0.1.4 Interpret and analyze temperature, pressure, and volume relationships
4.0.1.5 Demonstrate heat and heat transfer
4.0.1.6 Demonstrate energy and energy conversion
4.0.1.7 Differentiate sensible and latent heat

Competency 4.0.2: Analyze mechanical refrigeration cycle and components

Competency Builders:

4.0.2.1 Demonstrate heat absorption
4.0.2.2 Demonstrate heat rejection
4.0.2.3 Compare and analyze relation and function of evaporator(s), condenser(s), compressor(s), and metering device(s)
4.0.2.4 Compare various refrigerant characteristics

* Advancing
** Futuring

Competency 4.0.3: Analyze conditions of refrigerant in refrigeration cycle

Competency Builders:

4.0.3.1 Interpret and compare temperature-pressure chart relationship(s)
4.0.3.2 Measure and record saturation temperature of refrigerant
4.0.3.3 Measure and record superheat
4.0.3.4 Measure and record subcooling

Unit 5: Basic Shop Practices

Competency 5.0.1: Perform soldering and brazing procedures

Competency Builders:

5.0.1.1 Join materials with 95/5 solder
5.0.1.2 Join materials with low-temperature refrigerant-grade solder
5.0.1.3 Join materials with silver solder
5.0.1.4 Join materials with 15% silver brazing rod
5.0.1.5 Join materials with 45% silver brazing rod

Competency 5.0.2: Perform leak-detection procedures

Competency Builders:

5.0.2.1 Use soap bubble technique
5.0.2.2 Use nitrogen technique
5.0.2.3 Use electronic test
5.0.2.4 Use fluorescence technique*

Unit 6: Shop Practice and Tools

Competency 6.0.1: Demonstrate use of common hand tools

Competency Builders:

6.0.1.1 Use wrenches
6.0.1.2 Use gripping and holding tools
6.0.1.3 Use cutting tools
6.0.1.4 Use impact tools

* Advancing
** Futuring

Competency 6.0.2: Demonstrate use of refrigeration specialty tools

Competency Builders:

6.0.2.1 Use refrigeration valve wrenches
6.0.2.2 Use flare nut wrenches
6.0.2.3 Use wiring and crimping tools
6.0.2.4 Use inspection mirrors
6.0.2.5 Use staple tackers
6.0.2.6 Use tubing cutters and reamers
6.0.2.7 Use flaring tools
6.0.2.8 Demonstrate swagging
6.0.2.9 Use tubing benders
6.0.2.10 Use plastic tubing shears
6.0.2.11 Use pinch-off tool
6.0.2.12 Use metal workers hammer
6.0.2.13 Use reciprocating saw

Competency 6.0.3: Demonstrate use of specialized service and installation equipment

Competency Builders:

6.0.3.1 Use charging cylinder
6.0.3.2 Use vacuum pump
6.0.3.3 Use electrical leak detector
6.0.3.4 Use thermometer
6.0.3.5 Use fin comb
6.0.3.6 Use heat gun
6.0.3.7 Use piercing valves (soldered)
6.0.3.8 Use oil charging pump
6.0.3.9 Use charging station
6.0.3.10 Use soldering and welding equipment
6.0.3.11 Use sling psychrometer
6.0.3.12 Use air-velocity measuring instruments
6.0.3.13 Use combustion analyzer kit
6.0.3.14 Use electrical analyzing tools
6.0.3.15 Use manometer
6.0.3.16 Use electronic vacuum gauge
6.0.3.17 Use belt tension gauge
6.0.3.18 Use electronic charging scale
6.0.3.19 Use refrigerant recovery station

* Advancing
** Futuring

Unit 7: Installing Refrigeration and Air-Conditioning Equipment

Competency 7.0.1: Install window air conditioner

Competency Builders:

7.0.1.1 Read and interpret all equipment installation instructions
7.0.1.2 Determine power availability installation and capacity compatibility
7.0.1.3 Install air conditioner
7.0.1.4 Test unit operation
7.0.1.5 Instruct customer and complete final operations

Competency 7.0.2: Install central air conditioner and heat pump

Competency Builders:

7.0.2.1 Read and interpret all equipment installation instructions
7.0.2.2 Verify accuracy of unit and power supply
7.0.2.3 Install base for outdoor unit
7.0.2.4 Install outdoor unit
7.0.2.5 Install indoor coil
7.0.2.6 Connect vapor and liquid lines between indoor coil and outdoor unit and evacuate if not precharged
7.0.2.7 Install power supply
7.0.2.8 Install low-voltage system
7.0.2.9 Perform start-up procedures
7.0.2.10 Verify system operation and instruct customer

Competency 7.0.3: Install self-contained commercial refrigeration unit

Competency Builders:

7.0.3.1 Read and interpret all equipment installation instructions
7.0.3.2 Uncrate unit and place in position
7.0.3.3 Connect power supply and verify operation
7.0.3.4 Perform start-up procedures
7.0.3.5 Instruct customer

Competency 7.0.4: Install remote condensing unit with single cabinet

Competency Builders:

7.0.4.1 Read and interpret all equipment installation instructions
7.0.4.2 Uncrate cabinet and place in position
7.0.4.3 Install condensing unit
7.0.4.4 Install vapor and liquid lines
7.0.4.5 Pressure-test system
7.0.4.6 Evacuate and charge system
7.0.4.7 Perform start-up procedures
7.0.4.8 Instruct customer

Competency 7.0.5: Install remote commercial condensing unit with multiple cabinets

Competency Builders:

7.0.5.1 Read and interpret all equipment installation instructions
7.0.5.2 Uncrate cabinet and place in position
7.0.5.3 Install condensing unit
7.0.5.4 Install vapor and liquid lines
7.0.5.5 Pressure-test system
7.0.5.6 Evacuate and charge system
7.0.5.7 Perform start-up procedures
7.0.5.8 Instruct customer

Unit 8: Preventive Maintenance

Competency 8.0.1: Perform preventive maintenance (PM) on gas-fueled equipment

Competency Builders:

8.0.1.1 Clean pilot
8.0.1.2 Test pilot safety
8.0.1.3 Check ignition
8.0.1.4 Check main gas valve
8.0.1.5 Check and clean main burner(s)
8.0.1.6 Check draft
8.0.1.7 Check for fuel leaks
8.0.1.8 Perform visual check of burner operation

Competency 8.0.2: Perform PM on electric heating equipment

Competency Builders:

8.0.2.1 Measure amperage draw on elements
8.0.2.2 Check operation of sequencers and/or contactors

Competency 8.0.3: Perform PM on forced-air furnaces

Competency Builders:

8.0.3.1 Check blower cleanliness
8.0.3.2 Oil motor and check bearings
8.0.3.3 Check and lubricate blower bearings
8.0.3.4 Check fan belt and adjust tension
8.0.3.5 Inspect pulleys (i.e., sheaves)
8.0.3.6 Check pulley alignment
8.0.3.7 Inspect chimney
8.0.3.8 Inspect draft diverter and flue pipe
8.0.3.9 Inspect heat exchanger
8.0.3.10 Test fan control
8.0.3.11 Test limit switch(es)
8.0.3.12 Inspect wiring and tighten terminals
8.0.3.13 Clean and check thermostat
8.0.3.14 Verify anticipator setting

* Advancing
** Futuring

Competency 8.0.4: Perform PM on air handler

Competency Builders:

8.0.4.1 Check blower cleanliness
8.0.4.2 Oil motor and check bearings
8.0.4.3 Check and lubricate blower bearings
8.0.4.4 Check fan belt and adjust tension
8.0.4.5 Inspect pulleys (i.e., sheaves)
8.0.4.6 Check pulley alignment
8.0.4.7 Test fan control
8.0.4.8 Test limit switch(es)
8.0.4.9 Inspect wiring and tighten terminals
8.0.4.10 Clean and check thermostat
8.0.4.11 Verify anticipator setting

Competency 8.0.5: Perform PM on electronic air cleaner

Competency Builders:

8.0.5.1 Disconnect power and verify
8.0.5.2 Remove and clean prefilter and cells
8.0.5.3 Check ionizer wires
8.0.5.4 Test power pack
8.0.5.5 Reinstall dry components

Competency 8.0.6: Perform PM on humidifiers

Competency Builders:

8.0.6.1 Disconnect power and verify
8.0.6.2 Clean water pan
8.0.6.3 Clean or replace pads or drum
8.0.6.4 Check motor
8.0.6.5 Check water valve
8.0.6.6 Clean and check drain line
8.0.6.7 Check humidistat operation

Competency 8.0.7: Perform PM on indoor section of air conditioner or heat pump

Competency Builders:

8.0.7.1 Disconnect power and verify
8.0.7.2 Check metering device
8.0.7.3 Inspect coil and clean as needed
8.0.7.4 Clean drain pan
8.0.7.5 Clean drain line and trap

Competency 8.0.8: Perform PM on outdoor section of air conditioner or heat pump

Competency Builders:

8.0.8.1 Disconnect power and verify
8.0.8.2 Inspect coil and clean if required
8.0.8.3 Inspect fan blades and lubricate motor
8.0.8.4 Inspect contactors and electrical components
8.0.8.5 Inspect wiring and tighten connections
8.0.8.6 Inspect refrigeration lines
8.0.8.7 Check for leaks
8.0.8.8 Connect power and start unit
8.0.8.9 Check compression at start and during operation
8.0.8.10 Record compression amperage
8.0.8.11 Check refrigerant charge
8.0.8.12 Check and record fan operation
8.0.8.13 Check operation of reversing valve
8.0.8.14 Check operation of defrost controls

Unit 9: Troubleshooting Refrigeration and Air-Conditioning Equipment

Competency 9.0.1: Connect hermetic compressor to power supply

Competency Builders:

9.0.1.1 Check power supply and voltage specifications
9.0.1.2 Isolate compressor
9.0.1.3 Check compressor winding
9.0.1.4 Use start cord

Competency 9.0.2: Check circuitry of compressor, protector, and relay

Competency Builders:

9.0.2.1 Disconnect power
9.0.2.2 Isolate circuitry
9.0.2.3 Ohm-check components

Competency 9.0.3: Analyze capacitor

Competency Builders:

9.0.3.1 Disconnect power supply
9.0.3.2 Discharge capacitor
9.0.3.3 Remove capacitor
9.0.3.4 Inspect capacitor
9.0.3.5 Test capacitor

* Advancing
** Futuring

Competency 9.0.4: Connect manifold and gauges to service valves and check pressures

Competency Builders:

9.0.4.1 Check gauge calibration
9.0.4.2 Remove service caps
9.0.4.3 Attach hose connections
9.0.4.4 Purge hoses
9.0.4.5 Check pressures
9.0.4.6 Remove manifold gauge set
9.0.4.7 Replace service caps

Competency 9.0.5: Examine unit operation, oil level, and sight glass moisture indicator

Competency Builders:

9.0.5.1 Check unit operation
9.0.5.2 Check oil level
9.0.5.3 Check moisture indicator

Competency 9.0.6: Locate leak in charged refrigeration system using electronic leak detectors*

Competency Builders:

9.0.6.1 Check and calibrate leak detectors*
9.0.6.2 Perform visual check for signs of oil*
9.0.6.3 Check system with electronic detector*

Competency 9.0.7: Locate leak in refrigeration system without refrigerant charge

Competency Builders:

9.0.7.1 Connect manifold and gauges
9.0.7.2 Add ten pounds per square inch gauge (psig) vapor charge of proper refrigerant
9.0.7.3 Add nitrogen up to low side test pressure
9.0.7.4 Check system with electronic detector

Competency 9.0.8: Locate leak in refrigeration system using bubble method

Competency Builders:

9.0.8.1 Connect manifold and gauges
9.0.8.2 Pressurize system
9.0.8.3 Check system for leaks

Competency 9.0.9: Install saddle-type sweat on service valve and check pressure

Competency Builders:

9.0.9.1 Install service valve according to manufacturer's specifications
9.0.9.2 Install gauge manifold, purge line, and check pressure
9.0.9.3 Remove manifold and install valve cap

* Advancing
** Futuring

Competency 9.0.10: Analyze circuitry of refrigeration electrical defrost element

Competency Builders:

9.0.10.1 Disconnect power supply
9.0.10.2 Isolate defrost circuitry
9.0.10.3 Inspect defrost element
9.0.10.4 Ohm-check element

Competency 9.0.11: Check and adjust refrigeration control thermostat

Competency Builders:

9.0.11.1 Determine actual cut-in and cut-out temperatures
9.0.11.2 Compare readings to manufacturer's specifications
9.0.11.3 Adjust thermostat

Competency 9.0.12: Analyze circulation fan motor

Competency Builders:

9.0.12.1 Confirm power supply
9.0.12.2 Disconnect power supply
9.0.12.3 Check mechanically
9.0.12.4 Ohm-check motor winding
9.0.12.5 Check run capacitor
9.0.12.6 Reconnect power
9.0.12.7 Check rotation
9.0.12.8 Check amperage draw relative to master nameplate

Competency 9.0.13: Check blower assembly and filter

Competency Builders:

9.0.13.1 Disconnect blower power
9.0.13.2 Clean or replace filters according to airflow direction (watch arrow)
9.0.13.3 Inspect, lubricate, and adjust blower assembly
9.0.13.4 Complete final operations

Competency 9.0.14: Check condenser pump and drain

Competency Builders:

9.0.14.1 Clean pump assembly, check and drain trap, and check valve
9.0.14.2 Check pump operation
9.0.14.3 Perform final inspection and cleanup

Competency 9.0.15: Check humidistat

Competency Builders;

9.0.15.1 Determine relative humidity (RH)
9.0.15.2 Verify operation

Competency 9.0.16: Check humidity with sling psychrometer and determine wet bulb temperature

Competency Builders:

9.0.16.1 Prepare psychrometer for use
9.0.16.2 Operate sling psychrometer
9.0.16.3 Determine wet bulb temperature
9.0.16.4 Determine RH

Competency 9.0.17: Clean electronic air cleaner

Competency Builders:

9.0.17.1 Disconnect power supply
9.0.17.2 Determine type of air cleaner
9.0.17.3 Clean components
9.0.17.4 Complete final operations

Competency 9.0.18: Check system for burnout and install cleanup kit*

Competency Builders:

9.0.18.1 Recover refrigerant*
9.0.18.2 Remove compressor*
9.0.18.3 Conduct test for burnout*
9.0.18.4 Use cleanup kit*
9.0.18.5 Remove cleanup kit*
9.0.18.6 Replace compressor*
9.0.18.7 Perform final cleanup*

Competency 9.0.19: Check heat pump reversing system*

Competency Builders:

9.0.19.1 Check system operation pressures*
9.0.19.2 Check circuitry of solenoid valves*
9.0.19.3 Complete final operations*

Competency 9.0.20: Check hot-gas defrost solenoid and valve*

Competency Builders:

9.0.20.1 Check unit for ice buildup*
9.0.20.2 Check mechanical operation of unit*
9.0.20.3 Verify solenoid continuity*
9.0.20.4 Verify automatic return to refrigeration cycle*
9.0.20.5 Complete final operations*

Competency 9.0.21: Check and adjust water valve*

Competency Builders:

9.0.21.1 Locate valve and check operation*
9.0.21.2 Clean, adjust, or replace valve*
9.0.21.3 Complete final operations*

Competency 9.0.22: Check icemaker*

Competency Builders:

9.0.22.1 Verify operation of system according to original equipment manufacturer's (OEM) specifications*
9.0.22.2 Troubleshoot and repair electrical system*
9.0.22.3 Troubleshoot and repair mechanical system*
9.0.22.4 Verify operation and perform final cleanup*

Competency 9.0.23: Verify performance of oil pressure control*

Competency Builders:

9.0.23.1 Check pressures*
9.0.23.2 Locate and identify control*
9.0.23.3 Check compressor oil level*
9.0.23.4 Check final operations*

Competency 9.0.24: Check and adjust pressure safety controls*

Competency Builders:

9.0.24.1 Locate and inspect control*
9.0.24.2 Check pressures*
9.0.24.3 Adjust control operation*
9.0.24.4 Verify performance and final operations*

Competency 9.0.25: Check, test, and adjust thermostatic adjustment valve*

Competency Builders:

9.0.25.1 Locate and inspect valve*
9.0.25.2 Verify power element operation*
9.0.25.3 Adjust power element operation*
9.0.25.4 Verify performance and final operations*

Competency 9.0.26: Check and adjust automatic expansion valve*

Competency Builders:

9.0.26.1 Locate and inspect valve*
9.0.26.2 Check system pressures*
9.0.26.3 Verify valve operation*
9.0.26.4 Adjust valve*
9.0.26.5 Verify performance and final operations*

Competency 9.0.27: Check compressor efficiency*

Competency Builders:

9.0.27.1 Install measuring devices*
9.0.27.2 Obtain readings and determine efficiency*

Unit 10: Servicing and Repairing Refrigeration and Air-Conditioning Equipment

Competency 10.0.1: Evacuate refrigeration system

Competency Builders:

10.0.1.1 Install manifold and gauges
10.0.1.2 Recover refrigerant
10.0.1.3 Evacuate system to desired micron reading

Competency 10.0.2: Recharge system by weighing-in refrigerant

Competency Builders:

10.0.2.1 Install manifold and gauge set
10.0.2.2 Evacuate system according to manufacturer's specifications
10.0.2.3 Confirm refrigerant type
10.0.2.4 Connect refrigerant tank to manifold set
10.0.2.5 Purge charging hose
10.0.2.6 Charge system to nameplate specifications
10.0.2.7 Retest for leaks and complete operations

Competency 10.0.3: Fill charging cylinder unit

Competency Builders:

10.0.3.1 Evacuate charging cylinder
10.0.3.2 Connect unit to supply tank
10.0.3.3 Purge charging hose
10.0.3.4 Fill unit
10.0.3.5 Test for leaks and complete operations

Competency 10.0.4: Recharge refrigeration system using charging cylinder

Competency Builders:

10.0.4.1 Connect manifold and gauge set
10.0.4.2 Determine refrigerant amount and type
10.0.4.3 Verify system cleanness and evacuate if required
10.0.4.4 Connect cylinder to unit
10.0.4.5 Purge charging hose
10.0.4.6 Charge to manufacturer's specifications
10.0.4.7 Verify unit operation

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Competency 10.0.5: Pump system down into refrigerant receiver

Competency Builders:

10.0.5.1 Prepare system
10.0.5.2 Connect manifold and gauge set
10.0.5.3 Purge hoses
10.0.5.4 Close king valve on receiver outlet
10.0.5.5 Monitor high side pressure during pump down
10.0.5.6 Observe low side gauge and stop compressor at one pound per square inch gauge (psig)

Competency 10.0.6: Repair leak in system lines

Competency Builders:

10.0.6.1 Survey area of repair
10.0.6.2 Recover refrigerant
10.0.6.3 Perform necessary repair work
10.0.6.4 Replace and/or install dryer
10.0.6.5 Evacuate system according to manufacturer's specifications
10.0.6.6 Recharge and test system
10.0.6.7 Complete final operations

Competency 10.0.7: Remove and replace drier

Competency Builders:

10.0.7.1 Prepare system for repair (recover or pump down)
10.0.7.2 Locate drier and select replacement
10.0.7.3 Remove and replace drier (valve system present)
10.0.7.4 Evacuate according to manufacturer's specifications
10.0.7.5 Recharge system and perform final checkout (valve system present)

Competency 10.0.8: Repair evaporator with epoxy

Competency Builders:

10.0.8.1 Prepare system for repair
10.0.8.2 Repair evaporator
10.0.8.3 Close up system and leak-test unit
10.0.8.4 Evacuate system according to manufacturer's specifications
10.0.8.5 Charge unit according to manufacturer's specifications
10.0.8.6 Complete final operations

Competency 10.0.9: Remove and replace capillary tube

Competency Builders:

10.0.9.1 Prepare system for repair
10.0.9.2 Select and install replacement capillary tube
10.0.9.3 Close up system and test unit
10.0.9.4 Complete final operations

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Competency 10.0.10: Remove and replace high- or low-pressure safety control

Competency Builders:

10.0.10.1 Locate control and select replacement
10.0.10.2 Isolate control or recover refrigerant
10.0.10.3 Remove control
10.0.10.4 Install replacement control
10.0.10.5 Adjust control and verify operation
10.0.10.6 Complete final operations

Competency 10.0.11: Remove and replace compressor

Competency Builders:

10.0.11.1 Verify replacement compressor specifications
10.0.11.2 Disconnect power supply and verify
10.0.11.3 Recover refrigerant
10.0.11.4 Remove compressor
10.0.11.5 Install replacement compressor according to manufacturer's specifications
10.0.11.6 Select and install drier
10.0.11.7 Evacuate system according to manufacturer's specifications
10.0.11.8 Recharge system and check performance
10.0.11.9 Complete final operations

Competency 10.0.12: Remove and replace control thermostat

Competency Builders:

10.0.12.1 Deactivate power
10.0.12.2 Locate and remove control thermostat
10.0.12.3 Replace thermostat and verify performance
10.0.12.4 Complete final operations

Competency 10.0.13: Remove and replace fan motor

Competency Builders:

10.0.13.1 Disconnect power supply and verify
10.0.13.2 Remove fan motor
10.0.13.3 Select and install replacement motor
10.0.13.4 Verify operation
10.0.13.5 Complete final operations

Competency 10.0.14: Remove and replace motor overload protector

Competency Builders:

10.0.14.1 Disconnect power supply and verify
10.0.14.2 Locate and remove motor overload protector
10.0.14.3 Install and test replacement
10.0.14.4 Complete final operations

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Competency 10.0.15: Remove and replace capacitor

Competency Builders:

10.0.15.1 Disconnect power supply and verify
10.0.15.2 Discharge capacitor
10.0.15.3 Remove capacitor
10.0.15.4 Test new capacitor
10.0.15.5 Install capacitor
10.0.15.6 Complete final operations

Competency 10.0.16: Remove and replace defrost heater

Competency Builders:

10.0.16.1 Disconnect power supply and verify
10.0.16.2 Remove defrost heater
10.0.16.3 Select and install replacement heater
10.0.16.4 Complete final operations

Competency 10.0.17: Remove and replace defrost terminator

Competency Builders:

10.0.17.1 Disconnect power supply and verify
10.0.17.2 Remove defrost terminator
10.0.17.3 Select and install replacement terminator
10.0.17.4 Complete final operations

Competency 10.0.18: Remove and replace defrost timer

Competency Builders:

10.0.18.1 Disconnect power supply and verify
10.0.18.2 Locate and remove defrost timer
10.0.18.3 Install and test replacement timer
10.0.18.4 Complete final operations

Competency 10.0.19: Remove and replace relay

Competency Builders:

10.0.19.1 Disconnect power supply and verify
10.0.19.2 Remove relay
10.0.19.3 Select and install replacement relay
10.0.19.4 Complete final operations

Competency 10.0.20: Remove and replace humidistat

Competency Builders:

10.0.20.1 Remove control
10.0.20.2 Select and install replacement humidistat
10.0.20.3 Complete final operations

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Competency 10.0.21: Check system airflow*

Competency Builders:

10.0.21.1 Record temperature at supply and return duct faces*
10.0.21.2 Adjust fan speed*
10.0.21.3 Balance supply registers using dampers*
10.0.21.4 Complete final operations*

Competency 10.0.22: Remove and replace oil pressure safety control*

Competency Builders:

10.0.22.1 Identify and isolate oil pressure safety control*
10.0.22.2 Remove oil pressure safety control*
10.0.22.3 Select and install replacement control*
10.0.22.4 Purge system and check for leaks*
10.0.22.5 Complete final operations*

Competency 10.0.23: Remove and replace hot-gas defrost solenoid and valve*

Competency Builders:

10.0.23.1 Locate and remove valve*
10.0.23.2 Select and install replacement valve*
10.0.23.3 Complete final operations*

Competency 10.0.24: Remove and replace reversing valve*

Competency Builders:

10.0.24.1 Locate and remove valve*
10.0.24.2 Select and install replacement valve*
10.0.24.3 Complete final operations*

Competency 10.0.25: Remove and replace thermostatic expansion valve*

Competency Builders:

10.0.25.1 Locate and remove thermostatic expansion valve*
10.0.25.2 Select and install replacement valve*
10.0.25.3 Recharge system*
10.0.25.4 Test performance and adjust valve*
10.0.25.5 Complete final operations*

Competency 10.0.26: Remove and replace automatic expansion valve*

Competency Builders:

10.0.26.1 Locate and remove automatic expansion valve*
10.0.26.2 Select and install replacement valve*
10.0.26.3 Recharge system*
10.0.26.4 Test performance and adjust valve*
10.0.26.5 Complete final operations*

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Competency 10.0.27: Remove restriction from capillary tube*

Competency Builders:

10.0.27.1 Prepare system for repair*
10.0.27.2 Remove restriction*
10.0.27.3 Close up and recharge system*
10.0.27.4 Complete final operations*

Competency 10.0.28: Add oil to refrigeration system*

Competency Builders:

10.0.28.1 Perform preliminary tasks*
10.0.28.2 Create vacuum on low side*
10.0.28.3 Draw oil into system*
10.0.28.4 Recharge system and check operation*
10.0.28.5 Complete final operations*

Competency 10.0.29: Recharge expansion valve system using sight glass*

Competency Builders:

10.0.29.1 Install gauge and manifold set*
10.0.29.2 Evacuate system according to manufacturer's specifications*
10.0.29.3 Connect refrigerant tank to manifold set*
10.0.29.4 Purge charging hose*
10.0.29.5 Charge system according to manufacturer's specifications*
10.0.29.6 Retest for leaks and complete operations*

Unit 11: Installing Heating Systems

Competency 11.0.1: Design heating system*

Competency Builders:

11.0.1.1 Determine requirements*
11.0.1.2 Design distribution ducting*

Competency 11.0.2: Fabricate and install distribution system

Competency Builders:

11.0.2.1 Remove old distribution system
11.0.2.2 Fabricate distribution ducting
11.0.2.3 Install new distribution system

Competency 11.0.3: Install gas or electric heating unit

Competency Builders:

11.0.3.1 Remove old unit
11.0.3.2 Position and level new unit
11.0.3.3 Install duct work and flue
11.0.3.4 Connect fuel supply
11.0.3.5 Connect electrical lines
11.0.3.6 Perform burner adjustments on gas furnaces
11.0.3.7 Check element sequencing on electric furnaces
11.0.3.8 Verify safety fan control and balance system
11.0.3.9 Perform final operations

Competency 11.0.4: Install wood-burning unit

Competency Builders:

11.0.4.1 Verify proper flue and chimney construction
11.0.4.2 Install unit
11.0.4.3 Start and adjust unit

Competency 11.0.5: Install air-to-air heat pump

Competency Builders:

11.0.5.1 Read and interpret all installation instructions
11.0.5.2 Verify unit and power supply
11.0.5.3 Install base for outdoor unit
11.0.5.4 Install outdoor unit
11.0.5.5 Install indoor coil
11.0.5.6 Connect vapor and liquid lines between outdoor unit and indoor coil and evacuate if required
11.0.5.7 Install power supply
11.0.5.8 Install low-voltage system
11.0.5.9 Perform start-up procedures
11.0.5.10 Instruct customer

Competency 11.0.6: Install oil heating unit*

Competency Builders:

11.0.6.1 Remove old unit*
11.0.6.2 Position and level new unit*
11.0.6.3 Install duct work and flue*
11.0.6.4 Connect fuel supply*
11.0.6.5 Connect electrical lines*
11.0.6.6 Perform burner adjustments on oil furnaces*
11.0.6.7 Verify safety fan control and balance system*
11.0.6.8 Perform final operations*

Competency 11.0.7: Install water-to-air heat pump*

Competency Builders:

11.0.7.1 Verify adequacy of unit and power supply*
11.0.7.2 Position and level unit*
11.0.7.3 Install duct*
11.0.7.4 Install interconnecting tubing*
11.0.7.5 Check safety control*
11.0.7.6 Verify system and instruct customer*

Competency 11.0.8: Install active solar heating system**

Competency Builders:

11.0.8.1 Position and install collector units**
11.0.8.2 Install holding tank and indoor coil**
11.0.8.3 Install interconnecting tubing and control system**
11.0.8.4 Complete final operations**

Unit 12: Troubleshooting Heating Systems

Competency 12.0.1: Check oil supply

Competency Builders:

12.0.1.1 Check oil level in storage tank
12.0.1.2 Service storage tank
12.0.1.3 Complete final operations

Competency 12.0.2: Check pilot gas and thermocouple assembly

Competency Builders:

12.0.2.1 Observe gas safety procedures
12.0.2.2 Check pilot and thermocouple assembly
12.0.2.3 Complete final operations

Competency 12.0.3: Check wall thermostat

Competency Builders:

12.0.3.1 Clean thermostat
12.0.3.2 Adjust thermostat and anticipator
12.0.3.3 Complete final operations

Competency 12.0.4: Check gas valve assembly

Competency Builders:

12.0.4.1 Observe gas safety procedures
12.0.4.2 Verify voltage
12.0.4.3 Test total valve operation
12.0.4.4 Complete final operations

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Competency 12.0.5: Check and adjust gas manifold pressure

Competency Builders:

12.0.5.1 Observe gas safety procedures
12.0.5.2 Locate and expose manifold
12.0.5.3 Shut off gas supply to main gas valve
12.0.5.4 Connect manometer
12.0.5.5 Turn on gas
12.0.5.6 Perform start-up procedures
12.0.5.7 Adjust regulator according to manufacturer's specifications
12.0.5.8 Conduct operational check
12.0.5.9 Shut off gas supply
12.0.5.10 Remove manometer, replace plug, and leak-test
12.0.5.11 Complete final operations

Competency 12.0.6: Check electronic pilot systems on gas units

Competency Builders:

12.0.6.1 Follow gas safety procedures
12.0.6.2 Turn off power and verify
12.0.6.3 Locate ignition area
12.0.6.4 Check gap on coil settings
12.0.6.5 Disassemble pilot and clean assembly
12.0.6.6 Reinstall pilot assembly
12.0.6.7 Start up with power on and thermostat turned up
12.0.6.8 Perform leak-check test
12.0.6.9 Verify gas and pilot ignition
12.0.6.10 Shut down system
12.0.6.11 Complete final operations

Competency 12.0.7: Check and adjust blower systems

Competency Builders:

12.0.7.1 Turn off power and verify
12.0.7.2 Remove access panels
12.0.7.3 Examine wiring, belts, and pulleys (i.e., sheaves)
12.0.7.4 Examine cage
12.0.7.5 Lubricate if required
12.0.7.6 Adjust drive if required
12.0.7.7 Complete final operations

Competency 12.0.8: Check and adjust fan control

Competency Builders:

12.0.8.1 Locate fan control
12.0.8.2 Adjust fan control
12.0.8.3 Complete final operations

Competency 12.0.9: Check limit control

Competency Builders:

12.0.9.1 Locate limit control
12.0.9.2 Test limit control for operation
12.0.9.3 Complete final operations

Competency 12.0.10: Check and adjust barometric control on wood-burning units*

Competency Builders:

12.0.10.1 Locate and inspect barometric control*
12.0.10.2 Adjust control*
12.0.10.3 Complete final operations*

Competency 12.0.11: Check heat exchanger*

Competency Builders:

12.0.11.1 Perform visual inspection of heat exchanger*
12.0.11.2 Conduct illumination test*
12.0.11.3 Alternate heat exchanger tests*
12.0.11.4 Complete final operations*

Competency 12.0.12: Check oil ignition system*

Competency Builders:

12.0.12.1 Measure voltage supply to unit*
12.0.12.2 Measure ignition transfer voltage*
12.0.12.3 Check, clean, and adjust electrodes*
12.0.12.4 Check cad cell and reinstall burner assembly*
12.0.12.5 Complete final operations*

Competency 12.0.13: Check oil pump*

Competency Builders:

12.0.13.1 Prepare system for checks*
12.0.13.2 Check pump pressure*
12.0.13.3 Complete final operations*

Competency 12.0.14: Check and adjust residential-type oil burner*

Competency Builders:

12.0.14.1 Conduct preliminary inspection of unit*
12.0.14.2 Adjust pump pressure*
12.0.14.3 Conduct flue tests*
12.0.14.4 Complete final operations*

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Competency 12.0.15: Check wood-burner combustion system*

Competency Builders:

12.0.15.1 Check grate and fire box*
12.0.15.2 Check flue*
12.0.15.3 Start and adjust burner*
12.0.15.4 Complete final operations*

Competency 12.0.16: Check solar collectors*

Competency Builders:

12.0.16.1 Locate and inspect glazing*
12.0.16.2 Locate and inspect collection surface*
12.0.16.3 Verify installation*

Competency 12.0.17: Check and adjust pressure controls (i.e., solar, water-to-air, and geothermal types)*

Competency Builders:

12.0.17.1 Locate controls*
12.0.17.2 Start systems*
12.0.17.3 Check and adjust controls*
12.0.17.4 Complete final operations*

Competency 12.0.18: Check and adjust circulating pumps (i.e., solar, water-to-air, and geothermal types)*

Competency Builders:

12.0.18.1 Locate and check pumps*
12.0.18.2 Pressure-test systems*
12.0.18.3 Complete final operations*

Unit 13: Servicing and Repairing Heating Systems

Competency 13.0.1: Assist in replacing heat exchanger

Competency Builders:

13.0.1.1 Prepare unit for repairs
13.0.1.2 Remove old heat exchanger
13.0.1.3 Install new heat exchanger
13.0.1.4 Complete final operations

Competency 13.0.2: Assist in replacing heat exchanger in sealed combustion unit

Competency Builders:

13.0.2.1 Prepare unit for repair
13.0.2.2 Remove old heat exchanger
13.0.2.3 Select replacement heat exchanger
13.0.2.4 Reinstall heat exchanger and check operations
13.0.2.5 Complete final operations

Competency 13.0.3: Remove and replace limit control

Competency Builders:

13.0.3.1 Disconnect power and verify
13.0.3.2 Locate and remove old limit control
13.0.3.3 Select and install replacement control
13.0.3.4 Verify performance of new control
13.0.3.5 Complete final operations

Competency 13.0.4: Remove and replace fan control

Competency Builders:

13.0.4.1 Disconnect power and verify
13.0.4.2 Locate and remove old fan control
13.0.4.3 Select and install replacement control
13.0.4.4 Verify performance of new control
13.0.4.5 Complete final operations

Competency 13.0.5: Remove and replace combination fan limit control

Competency Builders:

13.0.5.1 Disconnect power and verify
13.0.5.2 Locate and remove old control
13.0.5.3 Select and install replacement control
13.0.5.4 Verify performance of new control
13.0.5.5 Compile final operations

Competency 13.0.6: Remove and replace gas valve assembly

Competency Builders:

13.0.6.1 Disconnect power and verify
13.0.6.2 Turn off gas at source
13.0.6.3 Remove old gas valve
13.0.6.4 Select and install replacement valve
13.0.6.5 Verify performance of new valve and leak-test
13.0.6.6 Check and adjust thermostat anticipator
13.0.6.7 Complete final operations

Competency 13.0.7: Remove and replace wall thermostat

Competency Builders:

13.0.7.1 Disconnect power and verify
13.0.7.2 Remove old wall thermostat
13.0.7.3 Select and install replacement thermostat
13.0.7.4 Verify operation of new thermostat and set anticipator
13.0.7.5 Complete final operations

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Competency 13.0.8: Remove and replace pilot safety

Competency Builders:

13.0.8.1 Disconnect power and verify
13.0.8.2 Locate defective component and remove
13.0.8.3 Select and install replacement component
13.0.8.4 Verify operation of new component
13.0.8.5 Complete final operations

Competency 13.0.9: Replace electronic pilot systems in gas units

Competency Builders:

13.0.9.1 Disconnect power and verify
13.0.9.2 Shut down power supply
13.0.9.3 Locate pilot assembly and solid-state control
13.0.9.4 Remove pilot assembly and solid-state control
13.0.9.5 Repair/replace pilot assembly or solid-state control as needed
13.0.9.6 Start up unit and verify operation
13.0.9.7 Complete final operations

Competency 13.0.10: Replace direct-drive blower motor

Competency Builders:

13.0.10.1 Disconnect power and verify
13.0.10.2 Remove and clean blower motor assembly
13.0.10.3 Remove motor
13.0.10.4 Inspect and clean blower cage and housing
13.0.10.5 Select replacement motor
13.0.10.6 Reinstall motor and check operations including amperage draw according to nameplate specifications
13.0.10.7 Complete final operations

Competency 13.0.11: Replace blower shaft and shaft bearings

Competency Builders:

13.0.11.1 Disconnect power and verify
13.0.11.2 Remove and clean blower assembly
13.0.11.3 Select replacement parts and reassemble blower
13.0.11.4 Reinstall blower assembly and check operations
13.0.11.5 Complete final operations

Competency 13.0.12: Replace belt-drive blower motor

Competency Builders:

13.0.12.1 Disconnect power and verify
13.0.12.2 Remove blower motor and inspect pulley
13.0.12.3 Select replacement motor
13.0.12.4 Reinstall motor and check operations including amperage draw according to nameplate specifications
13.0.12.5 Complete final operations

Competency 13.0.13: Remove and replace electrodes*

Competency Builders:

13.0.13.1 Locate electrodes*
13.0.13.2 Remove old electrodes*
13.0.13.3 Select and install replacement electrodes*
13.0.13.4 Verify performance of new electrodes*
13.0.13.5 Complete final operations*

Competency 13.0.14: Remove and replace oil nozzle*

Competency Builders:

13.0.14.1 Remove old oil nozzle*
13.0.14.2 Select and install replacement nozzle*
13.0.14.3 Verify operation of new nozzle*
13.0.14.4 Complete final operations*

Competency 13.0.15: Remove and replace cad cell*

Competency Builders:

13.0.15.1 Disconnect power supply*
13.0.15.2 Locate cad cell*
13.0.15.3 Remove and inspect cad cell*
13.0.15.4 Select and install replacement cad cell*
13.0.15.5 Verify performance of new cad cell*
13.0.15.6 Complete final operations*

Competency 13.0.16: Remove and replace oil pump*

Competency Builders:

13.0.16.1 Remove oil pump*
13.0.16.2 Select and install replacement pump*
13.0.16.3 Check operation of new pump*
13.0.16.4 Complete final operations*

Unit 14: Employability Skills

Subunit 14.1: Career Development

Competency 14.1.1: Investigate career options

Competency Builders:

14.1.1.1 Determine interests and aptitudes
14.1.1.2 Identify career options
14.1.1.3 Research occupations matching interests and aptitudes
14.1.1.4 Select career(s) that best match(es) interests and aptitudes
14.1.1.5 Identify advantages and disadvantages of career options, including nontraditional careers
14.1.1.6 Assess differences in wages, annual incomes, and job opportunities based on geographic location
14.1.1.7 Develop a career plan

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Competency 14.1.2: Analyze potential barriers to employment

Competency Builders:

14.1.2.1 Identify common barriers to employment
14.1.2.2 Describe strategies to overcome employment barriers

Unit 14: Employability Skills
Subunit 14.2: Decision Making and Problem Solving

Competency 14.2.1: Apply decision-making techniques in the workplace

Competency Builders:

14.2.1.1 Identify the decision to be made
14.2.1.2 Compare alternatives
14.2.1.3 Determine consequences of each alternative
14.2.1.4 Make decisions based on values and goals
14.2.1.5 Evaluate the decision made

Competency 14.2.2: Apply problem-solving techniques in the workplace

Competency Builders:

14.2.2.1 Diagnose the problem and its causes
14.2.2.2 Identify alternatives and their consequences in relation to the problem
14.2.2.3 Examine multicultural and nonsexist dimensions of problem solving
14.2.2.4 Utilize resources to explore possible solutions to the problem
14.2.2.5 Compare and contrast the advantages and disadvantages of each solution
14.2.2.6 Determine appropriate action
14.2.2.7 Evaluate results

Unit 14: Employability Skills
Subunit 14.3: Work Ethic

Competency 14.3.1: Evaluate the relationship of self-esteem to work ethic

Competency Builders:

14.3.1.1 Identify special characteristics and abilities in self and others
14.3.1.2 Identify internal and external factors that affect self-esteem

Competency 14.3.2: Analyze the relationship of personal values and goals to work ethic both in and out of the workplace

Competency Builders:

14.3.2.1 Distinguish between values and goals
14.3.2.2 Determine the importance of values and goals
14.3.2.3 Evaluate how values affect goals
14.3.2.4 Identify short-term and long-term goals
14.3.2.5 Prioritize personal goals
14.3.2.6 Describe how personal values are reflected in work ethic
14.3.2.7 Describe how interactions in the workplace affect personal work ethic
14.3.2.8 Examine how life changes affect personal work ethic

Competency 14.3.3: Demonstrate work ethic

Competency Builders:

14.3.3.1 Examine factors that influence work ethic
14.3.3.2 Exhibit characteristics that reflect an appropriate work ethic

Unit 14: Employability Skills

Subunit 14.4: Job-Seeking Skills

Competency 14.4.1: Prepare for employment

Competency Builders:

14.4.1.1 Identify traditional and nontraditional employment sources
14.4.1.2 Utilize employment sources
14.4.1.3 Research job opportunities, including nontraditional careers
14.4.1.4 Interpret equal employment opportunity laws
14.4.1.5 Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process
14.4.1.6 Prepare for generic employment tests and those specific to an occupation/organization

Competency 14.4.2: Design a résumé

Competency Builders:

14.4.2.1 Identify personal strengths and weaknesses
14.4.2.2 List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, and work experience
14.4.2.3 Demonstrate legible written communication skills using correct grammar, spelling, and concise wording
14.4.2.4 Complete résumé using various formats
14.4.2.5 Secure references

Competency 14.4.3: Complete and process job application forms

Competency Builders:

14.4.3.1 Explain the importance of an application form
14.4.3.2 Identify ways to obtain job application forms
14.4.3.3 Describe methods for handling illegal questions on job application forms
14.4.3.4 Demonstrate legible written communication skills using correct grammar, spelling, and concise wording
14.4.3.5 Return application to proper person, request interview, and follow up

Competency 14.4.4: Demonstrate interviewing skills

Competency Builders:

14.4.4.1 Investigate interview environment and procedures
14.4.4.2 Explain the critical importance of personal appearance, hygiene, and demeanor
14.4.4.3 Demonstrate question and answer techniques
14.4.4.4 Demonstrate methods for handling difficult and/or illegal interview questions

Competency 14.4.5: Secure employment

Competency Builders:

14.4.5.1 Identify present and future employment opportunities within an occupation/organization
14.4.5.2 Research the organization/company
14.4.5.3 Use follow-up techniques to enhance employment potential
14.4.5.4 Compare and evaluate job offers

Unit 14: Employability Skills

Subunit 14.5: Job Retention Skills

Competency 14.5.1: Analyze the organizational structure of the workplace

Competency Builders:

14.5.1.1 Identify and evaluate employer expectations regarding job performance, work habits, attitudes, personal appearance, and hygiene
14.5.1.2 Be aware of and obey all company policies and procedures
14.5.1.3 Examine the role/relationship between employee and employer
14.5.1.4 Recognize opportunities for advancement and reasons for termination

Competency 14.5.2: Maintain positive relations with others

Competency Builders:

14.5.2.1 Exhibit appropriate work habits and attitude
14.5.2.2 Identify behaviors to establish successful working relationships
14.5.2.3 Cooperate and compromise through teamwork and group participation
14.5.2.4 Identify alternatives for dealing with harassment, bias, and discrimination based on race, color, national origin, sex, religion, handicap, or age

Unit 14: Employability Skills
Subunit 14.6: Job Advancement

Competency 14.6.1: Analyze opportunities for personal and career growth

Competency Builders:

14.6.1.1 Determine opportunities within an occupation/organization
14.6.1.2 Compare and contrast other opportunities
14.6.1.3 List benefits of job advancement
14.6.1.4 Evaluate factors involved when assuming a new position within or outside an occupation/organization

Competency 14.6.2: Exhibit characteristics needed for advancement

Competency Builders:

14.6.2.1 Display a positive attitude
14.6.2.2 Demonstrate knowledge of a position
14.6.2.3 Perform quality work
14.6.2.4 Adapt to changing situations and technology
14.6.2.5 Demonstrate capability for different positions
14.6.2.6 Participate in continuing education/training programs
14.6.2.7 Respect, accept, and work with ALL individuals in the workplace

Unit 14: Employability Skills
Subunit 14.7: Technology in the Workplace

Competency 14.7.1: Assess the impact of technology in the workplace

Competency Builders:

14.7.1.1 Cite how past business/industry practices have influenced present business/industry processes
14.7.1.2 Investigate the use of technology in the workplace
14.7.1.3 Analyze how present skills can be applied to learning new technologies

Competency 14.7.2: Use a variety of technological applications

Competency Builders:

14.7.2.1 Explore basic mathematical, scientific, computer, and technological principles
14.7.2.2 Use technology to accomplish assigned tasks
14.7.2.3 Create solutions to problems using technical means

Unit 14: Employability Skills
Subunit 14.8: Lifelong Learning

Competency 14.8.1: Apply lifelong learning to individual situations

Competency Builders:

14.8.1.1 Define lifelong learning
14.8.1.2 Identify factors that cause the need for lifelong learning

Competency 14.8.2: Adapt to change

Competency Builders:

14.8.2.1 Analyze the effects of change
14.8.2.2 Identify reasons why goals change
14.8.2.3 Describe the importance of flexibility when reevaluating goals
14.8.2.4 Evaluate the need for continuing education/training

Unit 14: Employability Skills
Subunit 14.9: Economic Education

Competency 14.9.1: Analyze global enterprise system

Competency Builders:

14.9.1.1 Identify characteristics of various enterprise systems
14.9.1.2 Examine the relationship between competition, risk, and profit
14.9.1.3 Illustrate how supply and demand influence price

Competency 14.9.2: Evaluate personal money management

Competency Builders:

14.9.2.1 Describe the need for personal management records
14.9.2.2 Identify methods of taxation
14.9.2.3 Analyze how credit affects financial security
14.9.2.4 Compare types and methods of investments
14.9.2.5 Prepare a personal budget
14.9.2.6 Be an informed and responsible consumer
14.9.2.7 Analyze the effects of advertising on the consumer

Unit 14: Employability Skills
Subunit 14.10: Balancing Work and Family

Competency 14.10.1: Analyze the effects of family on work

Competency Builders:

14.10.1.1 Recognize how family values, goals, and priorities are reflected in the workplace
14.10.1.2 Identify present and future family structures and responsibilities
14.10.1.3 Describe personal and family roles
14.10.1.4 Analyze concerns of working parent(s)
14.10.1.5 Examine how family responsibilities can conflict with work
14.10.1.6 Resolve family-related conflicts
14.10.1.7 Explain how to use support systems/community resources to help resolve family-related conflicts

Competency 14.10.2: Analyze the effects of work on family

Competency Builders:

14.10.2.1 Identify responsibilities associated with paid and nonpaid work
14.10.2.2 Compare the advantages and disadvantages of multiple incomes
14.10.2.3 Explain how work can conflict with family responsibilities
14.10.2.4 Explain how work-related stress can affect families
14.10.2.5 Identify family support systems and resources

Unit 14: Employability Skills
Subunit 14.11: Citizenship in the Workplace

Competency 14.11.1: Exercise the rights and responsibilities of citizenship in the workplace

Competency Builders:

14.11.1.1 Identify the basic rights and responsibilities of citizenship
14.11.1.2 Examine the history and contributions of all racial, ethnic, and cultural groups

Competency 14.11.2: Cooperate with others in the workplace

Competency Builders:

14.11.2.1 Identify situations in which compromise is necessary
14.11.2.2 Examine how individuals from various backgrounds contribute to work-related situations
14.11.2.3 Demonstrate initiative to facilitate cooperation
14.11.2.4 Give and receive constructive criticism to enhance cooperation

Unit 14: Employability Skills
Subunit 14.12: Leadership

Competency 14.12.1: Evaluate leadership styles appropriate for the workplace

Competency Builders:

14.12.1.1 Identify characteristics of effective leaders
14.12.1.2 Compare leadership styles
14.12.1.3 Demonstrate effective delegation skills
14.12.1.4 Identify opportunities to lead in the workplace

Competency 14.12.2: Demonstrate effective teamwork skills

Competency Builders:

14.12.2.1 Identify the responsibilities of a valuable group member
14.12.2.2 Exhibit open-mindedness
14.12.2.3 Identify methods of involving each member of a team
14.12.2.4 Contribute to the efficiency and success of a group
14.12.2.5 Determine ways to motivate others

Competency 14.12.3: Utilize effective communication skills

Competency Builders:

14.12.3.1 Identify the importance of listening
14.12.3.2 Demonstrate assertive communication
14.12.3.3 Recognize the importance of verbal and nonverbal cues and messages
14.12.3.4 Analyze written material
14.12.3.5 Prepare written material
14.12.3.6 Give and receive feedback
14.12.3.7 Articulate thoughts
14.12.3.8 Use appropriate language

Unit 14: Employability Skills
Subunit 14.13: Entrepreneurship

Competency 14.13.1: Evaluate the role of small business in the economy

Competency Builders:

14.13.1.1 Identify the benefits of small business to a community
14.13.1.2 Analyze opportunities for small business in a community

Competency 14.13.2: Examine considerations of starting a business

Competency Builders:

14.13.2.1 Research a business idea
14.13.2.2 Compare various ways to become a small business owner
14.13.2.3 Investigate factors to consider in financing a new business
14.13.2.4 Evaluate entrepreneurship as a career option

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